

Growing WILD

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Utah's Project WILD Newsletter



Utah's Renown Rodents: The Beaver, Porcupine and Pocket Gophers

When one makes reference to a "rodent" what many often envision is a small, furry, dark-eyed mouse or a somewhat larger rat-like critter with a long tail. Although the two animals above would indeed be rodents, and do actually characterize a good number of them, rodents are really much more. Ranging in size from the smallest of mice at less than an ounce, to the giant capybara of South America, some of which tip the scale at over 140 pounds, rodents comprise a very diverse and complex order. With over 1,800 species worldwide in 29 living families, members of the order Rodentia form the largest order of mammals, and account for close to 40 percent of the world's mammal species. Highly successful, they thrive in every habitat from the high arctic tundra to the hottest, driest deserts, from city to farm and in more areas than any other order of mammals. Intelligent and adaptable, they also have influenced human history more than any other group of mammals on earth.

New World mice and rats (including voles, lemmings and muskrats) form the largest of eight families native to North America, followed by the squirrel family which includes marmots, prairie dogs, chipmunks, ground squirrels and flying squirrels. The remaining five families of rodents in North America include pocket mice, kangaroo rats, jumping mice, beavers, porcupines and pocket gophers. Rodent families from other parts of the world include species such as gerbils, hamsters, guinea pigs, springhares, jerboas, chinchillas, agoutis, mole-rats, dormice and Old World porcupines, rats and mice.

Since the order of rodents is especially large, this issue of *Growing WILD* will feature a set of rodents which are relatively well known to most Utahns: the American beaver, the North American porcupine and pocket gophers. Other families of North American rodents found in Utah will be covered in future issues.

The most definitive feature of rodents is their ever-growing incisors, their two front upper and lower pairs of teeth designed especially for gnawing hard objects. Aptly, their name "rodent" comes from the Latin word, *rodere*, which means to gnaw. Gnawing is essential for a rodent to wear down these continually growing incisors, and chisel-sharp edges are maintained due to the fact that enamel on the outer surface of a rodent's incisors is harder than the dentine of the rest of these teeth. Through the action of gnawing, tips of the upper pair wear away those of the lower pair, and visa versa, keeping their teeth well honed for chewing on and on. If the incisors of a rodent, which can grow up to an eighth of an inch per week, somehow become misaligned so they no longer automatically wear down with gnawing, the incisors will grow around in an arc and pierce the rodent's skull.

Gnawing is facilitated by a large gap behind the incisors, called the diastema, into which the lips can be drawn. In addition, sets of complexly structured grinding molars, transversed by convoluted layers of enamel, and jaw muscles serve to make rodents extremely efficient herbivores.

Other features and behaviors common to most rodents include a keenly developed sense of smell and hearing, long, touch-sensitive whiskers (vibrissae), plantigrade locomotion (walking on the soles of their feet with their heels touching the ground) and a good deal of communication through odors produced by a variety of scent glands.

Throughout history, rodents have been of considerable economic importance to people worldwide, particularly as pests that feed on crops, stored grains and trees, and as vectors of diseases impacting humans and domestic animals. On the positive side however, rodents annually yield furs worth millions of dollars, have served extensively in medical research on human diseases and studies of basic biology, and have been an abundant source of nutrition for numerous predators higher up on the food chain.



American
Beaver

**Read on to learn about Utah's more renown rodents:
the beaver, porcupine and pocket gophers.**

Rodents with a Reputation!

American Beaver: *Castor canadensis*

Dusk settles in as a soft orange sun sinks towards the horizon. Angled sunbeams highlight a small pond nestled within the aspens lining a mountain valley. Chirping birds, croaking frogs and buzzing mosquitos harmonize for an early evening concert. A few moments later, a subtle v-shaped wake passes swiftly across the still surface of the pond — the snout of a beaver gliding through the water as it swims along. The beaver has just moved in and has begun building a dam.

Expert engineers, beavers are famous for their amazing dam building skills. “But why build a dam?” you might ask. Basically, beavers need areas with water deep enough to not freeze solid during the winter. So when arriving in an area without sufficiently deep water, a beaver builds a dam across a shallow portion of the stream to create a pond. Beyond preventing freezing, the deeper water also improves access to more trees within an area and affords the beavers more protection from potential foes such as bears, bobcats or wolves. In addition, saturation of the soil in the area promotes regeneration of the types of trees fed upon by beavers.

Beaver dams are made of logs, branches and rocks plastered together with mud. To start, a beaver first drags leafy branches and logs from trees it has felled to a narrow part of the stream. It then aligns the logs in the same direction as the flow of the stream so the logs become wedged into the bottom of the stream through the force of the moving water. Next, with mud and stones gathered from the bottom of the river and carried against its chest with agile forepaws, the beaver, like a crafty mason, fills gaps between the branches and leaves. Successive layers of branches followed by mud and stone are laid down to build up the dam until finally the flowing river is contained. A pair of beavers can build a 12-foot wide dam in just two nights, giving true meaning to the saying, “busy as a beaver.” Dams are usually three to four feet high and 50 to 200 feet long depending on the size of the stream and the terrain. The average-sized logs used to construct the dam measure about four to twelve inches in diameter.

Beavers belong to the family Castoridae. The family name is associated with castoreum, the musky-smelling orangish-colored oily substance secreted from the beaver’s castor glands found at the base of its tail. Beavers place their castor oil onto small mounds of mud they use to scent-mark their territories. Castor oil from beavers has been used by people as the primary ingredient in perfume fixatives for centuries. There are only two living members in this family, the American beaver and its close, smaller cousin, the European beaver (*Castor fiber*). *Castor*, the only genus of the family, originated in Europe during the Pliocene era (7-3 million years ago). Some members later entered North America, and with geographic isolation, over time evolved into the current North American species. During the Pleistocene era, 10,000 years ago, beavers coexisted with giant, seven-foot long, now extinct forms of beavers which weighed 600 to 700 pounds.

With some adults weighing in at over 60 pounds and measuring three to four feet long, including its trademark tail, the American beaver is the second largest (North America’s largest) rodent in the world. Unlike most other mammals, beavers continue growing throughout their lives, which may be as long as 12 years in the wild. Beavers are usually chestnut or reddish-brown in color but may vary from yellowish-brown to almost black. Their common name, “beaver,” derived from a Sanskrit word meaning “big and brown,” is certainly appropriate. Like many mammals, beavers wear two coats of fur. The outer one, made up of tough guard hairs, is like a raincoat that sheds water and protects the underfur. The inner coat, or underfur is thick, soft and furry, and traps air to hold in body heat. It was this especially luxurious underfur of the beaver that lured trappers into the wilds, opening up the continent, but in the process nearly bringing the species to its demise. Today in Utah, beavers are fairly common in suitable riparian areas of the state.

The beaver is truly built for its aquatic existence, possessing many fascinating adaptations that enable it to thrive in its watery world. The beaver’s distinctive 12- to 17-inch long nearly hairless and scaly, paddle-like tail serves superbly as a rudder and diving plane when swimming. When, slapped squarely on the water’s surface, it also creates a loud “WHAP” sound to warn other beavers of danger. It also stores fat for wintertime energy demands.

See-through membranous eyelids cover and protect the beaver’s eyes like goggles of a pearl diver. Watertight flaps of skin seal off its nostrils and ears. And its lips can be drawn tightly behind its protruding teeth allowing it to chew wood below the surface without swallowing water. A special flap at the back of its mouth also seals off the mouth cavity from the air pipe letting the beaver breathe while ferrying sticks and branches through the water.

Fully webbed hind feet propel the beaver silently through the water at speeds of five miles per hour. An oversized liver and large lungs hold extra oxygenated blood and air for long dives, which can last up to 15 minutes, and cover a half mile. And while diving, its heart beat slows to half the normal rate to make more efficient use of stored oxygen. Also, waterproofing oil from a gland at the base of its tail, built in combs (split toenails on the fourth toe of each hind foot) to brush the oil over its coat, and dense water-repelling underfur keep the beaver warm and dry.

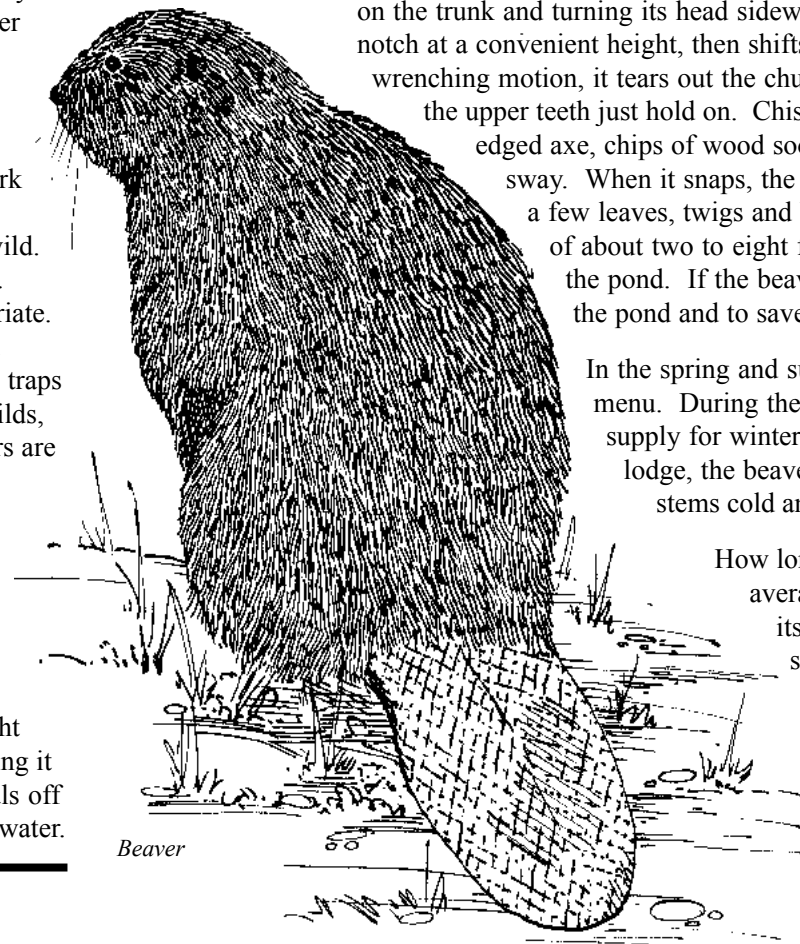
Beavers live in close-knit family units of six to twelve beavers including two parents, kits and yearlings (young born the previous year). Beavers pair up for life. Mating takes place in January or February, and from one to eight (average of four) kits are born anytime from late April to June. Weighing about one pound and measuring 15 inches when born, the kits are covered with fine soft fur and eyes open wide. They need no swimming lessons, and can even swim within their first few hours of life. Young beavers live with their parents until they reach two years of age. Just before the birth of a new litter, they are booted out and forced to find a home of their own.

Beavers either dig a den into the side of a bank at the edge of their pond, or build a lodge. Bankside dens are built where streams are too large or swift to dam. Lodges are built where the water level is more stable. A family of beavers builds its lodge with the same materials and in much the same way as it builds a dam. Lodges are started with a ring of sticks which ultimately becomes the main underwater door. As the lodge is built upward, a hollow space is maintained inside. Large tree limbs are used for major supports and small branches are added for strength and to fill spaces. Mud is gathered and deftly applied with their forepaws to cement the structure together. A mud floor is constructed several inches above the level of the water within the lodge and lined with plant materials to make a soft, cozy nest. When complete, the lodge can stand up to six feet above the water’s surface. They usually measure between eight and twelve feet in diameter and the walls may be more than three feet thick at the base. Inside, the dark domed chamber measures about two or three feet in diameter and about three feet high. Spaces between some of the branches in the ceiling let in fresh air.

To a beaver, a tender young tree is a meal waiting to be eaten. Beavers eat the leaves, twigs and bark (especially the tender inner bark or *cambium* layer) of aspen, willow, cottonwood, birch and alder trees. On land the beaver is slow and awkward. It waddles clumsily on large, pigeon-toed rear feet and short front limbs, looking much like a furry tank. Upon selecting a tree, the beaver sits up on its hind end and props itself up with its flat tail. Placing its forepaws on the trunk and turning its head sideways, it uses its chisel-sharp incisors to chop down the tree. First it chips out a notch at a convenient height, then shifts to a lower point about three inches below to chip out another. Then with a wrenching motion, it tears out the chunk of wood in between. The cutting work is all done with the lower incisors; the upper teeth just hold on. Chiseling through the trunk with the efficiency of a lumberjack wielding a double-edged axe, chips of wood soon litter the ground around its feet. And then the tree begins to creak and sway. When it snaps, the beaver dashes aside. After the tree has fallen, the beaver returns to munch on a few leaves, twigs and bark of smaller branches, and then chops up the rest into manageable lengths of about two to eight feet. Portable lengths are then dragged to the water’s edge and towed across the pond. If the beaver has to go too far it digs canals to make it safer to work farther away from the pond and to save energy in transporting logs which are much easier to float than haul on land.

In the spring and summer beavers also add grasses, ferns, aquatic plants, fungi and berries to their menu. During the fall they store many of the woody branches and stems they gather as a food supply for winter. By anchoring them in the mud at the bottom of the pond near their burrow or lodge, the beavers create an underwater pantry. The water acts like a refrigerator, keeping the stems cold and preserving their nutritional value.

How long a beaver family makes use of a pond depends mainly on the food supply. An average beaver requires an aspen tree about one to three inches thick at the base or its equivalent each day, and a family of beavers can cut from one to two thousand trees in a year. As the beavers of successive years and generations literally eat themselves out of house and home, they must search farther and farther away for trees. When the energy involved in hauling logs and branches or the risk of being caught by predators becomes too great, the beavers must head out in search of a new place to call home. Years later after the forest returns, another family of beavers may resettle the old homestead.



Beaver

North American Porcupine *Erethizon dorsatum*

A clear blue sky contrasted sharply with the glistening white snow and dark pines carpeting the mountain valley. Though the sun shined brightly, the air was cool and crisp. And wedged high up in the crotch of a tall craggy pine at the edge of a stand was a big old prickly porcupine, completely unnoticed by the skiers swooshing down the hillside below. If seen, the porcupine would have needed no formal introduction to be recognized.

The only member of its family, Erethizontidae, north of Mexico, the porcupine is definitely one of the most familiar and distinct of all mammals. Despite few fossil records of it and its immediate ancestors, evidence indicates porcupines have only been part of the North American fauna since about two to three million years ago when they waddled north from South America. Today they occur within forested areas of the continent from Alaska to northern Mexico, excluding a small area in southern California and the southeastern and gulf coast states. Porcupines are common in Utah, where they prefer coniferous forests and mixed forest areas. They may be found in riparian zones, deserts and shrubland areas as well.

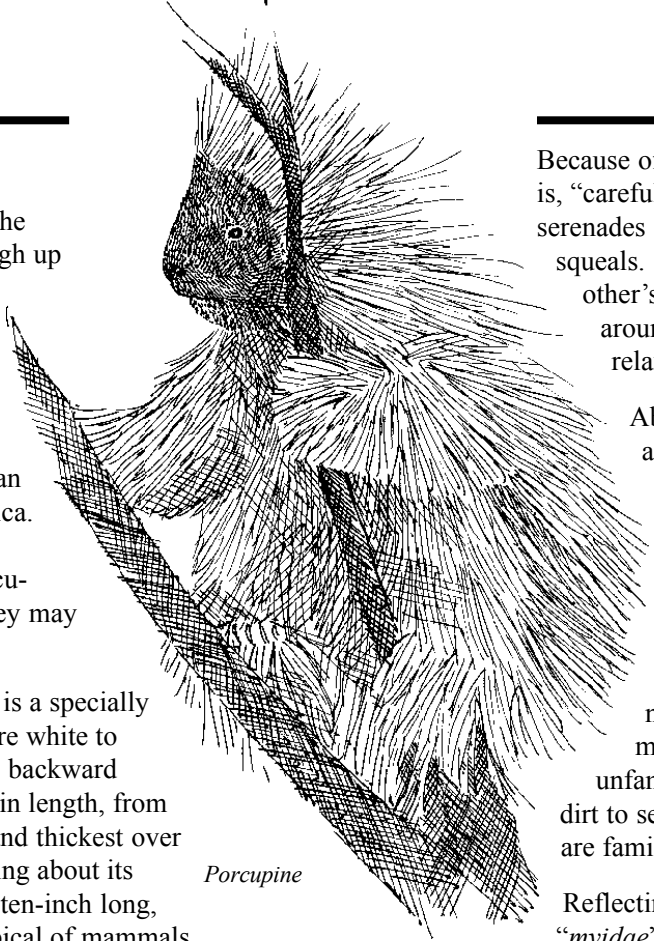
The trademark of the porcupine is, of course, its quills—all 30,000 or so of them. Each quill is a specially modified hair made stiff by its cylindrical shape and spongy material of its core. The quills are white to yellowish-ivory in color with brown or black needle-sharp tips, each covered with numerous backward pointing barbs. They are lightly connected to a layer of muscle just below the skin. Varying in length, from less than an inch to more than four inches, the quills are shortest on the cheeks and longest and thickest over the shoulders and tail. Only the nose, throat and belly of the porcupine lack quills. When going about its business undisturbed, most of the porcupine’s quills are hidden amongst its shaggy, eight- to ten-inch long, yellowish-brown guard hairs, lying flat against its body. Beneath them is a thick underfur typical of mammals.

At best capable of a slow lumbering gallop, instead of speed, the placid porcupine relies on its prickly armament for defense. When threatened, it arches its back and raises its quills, creating a pincushion of defense to warn the enemy. If attacked, the porcupine lashes its tail against its assailant, driving dozens of readily detached quills into the attackers flesh. Once embedded, the barbs on the tips the quills swell from the surrounding skin moisture, forcing the quills even deeper. Each time the victim’s muscles contract, they penetrate even further, sometimes traveling through the body, and possibly puncturing a vital organ. Contrary to popular belief, porcupines do not “shoot” their quills, though it may appear so as they flail their tail in defense. Lost quills are replaced in a few weeks.

Even though many predators are not willing to take-on a porcupine, its potentially lethal defense is not a fail-safe guarantee. Their most formidable foe is the fisher, a large member of the weasel family, which is especially adept at flipping porcupines over without getting stuck. Other skillful predators include mountain lions, bobcats and coyotes. Thanks to their strong defense however, they have an average life expectancy of nine to ten years. Indeed, the literal translation of their scientific name, “irritable back,” is certainly a good description.

Porcupines are North America’s second largest rodent, averaging 36 inches in length including a 6-inch tail, and weighing about 20 pounds. They are skilled tree climbers, owing to their long, curved claws, special knobby, gripping pads on the bottom of their feet and their spiny tail which they use as a prop. As far as diet, they are almost exclusively vegetarians. In spring they feed on leaves, twigs, fruits and roots of various green plants. In winter, they chew through the rough outer bark of various evergreens and hardwoods to get at the nutritious inner bark (cambium layer) upon which they mainly subsist. Mistletoe is also a particularly favorite winter fare. Porcupines seem to have to have favorite feeding trees that can be recognized by their cropped and stunted upper branches and pale patches of bare wood at various heights called “blazes,” where the porcupine has scraped away the outer bark of the tree. These trees can also be identified by the many “niptwigs,” terminal branches that the porcupine has cut off to reach the tender buds and needles at the end of a branch, littering the ground beneath the tree.

Being nocturnal, porcupines tend to rest during the day, often high up in a tree, or in one of their typical den sites such as a cave or hollow log. An unusual quirk they have is an intense appetite for salt which leads them to chew on wooden objects such as tool handles and canoe paddles or leather gear—basically anything that has absorbed human perspiration through use. They also regularly chisel away upon cast antlers of deer, elk and moose to supplement their other mineral requirements.



Porcupine

Because of their quills, a question that often arises in regard to porcupines is, “How do porcupines mate?” The answer is, “carefully.” Contrary to most rodents, porcupines mate in the fall and early winter. During courtship, a male serenades a female with a gamut of grumbles and low humming sounds, an overture which is often rejected with loud squeals. They also engage in an odd “love dance,” where each stands on their hind feet with their paws on each other’s shoulders. Throughout the dance, they whine, grunt, rub noses and quite frequently belt each other around, sometimes to the point of knocking one another down. When the female is ready to mate, the female relaxes her quills and moves her tail out of harm’s way.

About seven months later in May or June, the female gives birth to one “porcupette.” Quills of the newborn are well formed, but short and soft, preventing a painful delivery. They harden within an hour though, becoming sharp and stiff enough to inflict serious injury. Within the year the young porcupine is off on its own, trekking through the forest deceptively cloaked in its spiny coat of quills.

Pocket Gophers: *Thomomys sp.*

The group of college students gathered along a wash in the Mojave desert listened closely to the biologist sharing interesting facts about the wild inhabitants of the area. Standing towards the back of the group, I noticed one of those wild inhabitants momentarily checking us out. A small, dark-furred, beady-eyed mammal with long front teeth had nervously poked its head up through a mound of dirt. Startled by the unfamiliar crowd, the little critter, a pocket gopher, immediately retreated back into its hole, shoving up a plug of dirt to seal it off. Because pocket gophers rarely come above ground, few people ever actually see one, though most are familiar with the mounds of excavated soil they create as a result of tunneling through the earth below.

Reflecting their earthly lifestyle, the family name for pocket gophers is Geomyidae—“*geo*” meaning earth and “*myidae*” meaning mice. *Thomomys*, the generic epithet of the various western pocket gopher species comes from the Greek words “*thomos*” meaning heap and “*mus*” meaning mouse. The “pocket” part of their common name comes from the large, external fur-lined cheek pouches they carry on both sides of their mouth and “gopher” is a derived from a French word, “*gaufre*” which means “honeycomb” and refers to the subterranean network of tunnels for which gophers are famous.

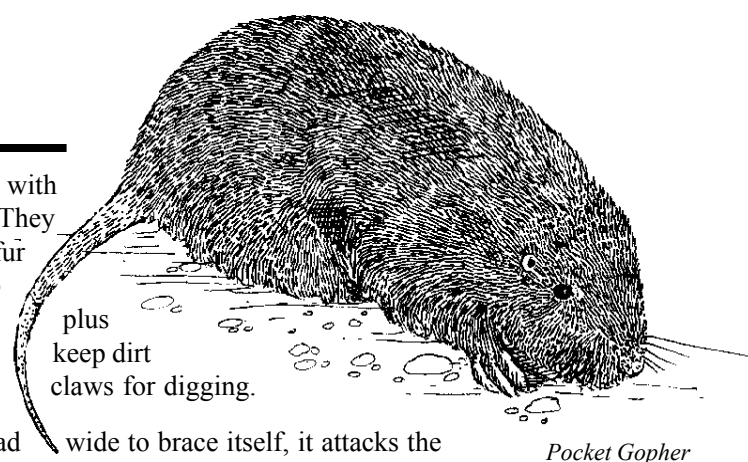
As a family, pocket gophers are native only to North and Central America, ranging from southwest Canada across the western United States and parts of the Southeast, down through Mexico to the Panama, Colombia border. Three relatively similar species, the northern (*T. talpoides*), Botta’s (or Valley) (*T. bottae*) and Idaho (*T. idahoensis*) pocket gophers reside in Utah. Within the range of their distribution, pocket gophers are ubiquitous in virtually all regions, from deserts below sea level to high mountain tops — pretty much all areas with deep, loose, sandy soils through which they can dig and plants upon which they can feed.

Common throughout Utah, the range of the Botta’s pocket gopher extends throughout the southwestern United States and northern Mexico. Also widespread and abundant, the northern pocket gopher ranges across the more northern portions of the western United States and up through western Canada. The Idaho pocket gopher, the rarest of the Utah species, occurs only in Rich and Dagget counties, and parts of Idaho and Wyoming. Similar in their ecology, reproduction and behavior, and with overlapping ranges in parts of the state, distinguishing between the three different pocket gophers, which even within their own species vary considerably in size, color and environments inhabited, can be difficult. Good field guides discuss a few minor differences in appearance.

Botta’s pocket gophers are dark brown, buffy or grayish above and purplish on the sides. Their belly is slightly lighter and the tail is tan to grayish. Their ears are small and rounded with a similarly-sized, three-eighths of an inch dark patch behind each. Northern pocket gophers are rich brown or yellowish-brown but often simply match the color of the soil. Their feet are whitish and their orange upper incisors are often tipped with white. They also have white markings beneath the chin, and behind each of their small, rounded ears, a large dark patch which measures about three times the size of each ear. Idaho pocket gophers, only recently classified as distinct from northern pocket gophers have yellowish brown or buffy fur tipped with dark brown. Their feet are whitish and they have dark gray fur around the nose.

Pocket gophers are truly fossorial animals (specialized for digging or burrowing) with underground-living equipment superior to anything found in the realm of rodents. Some of their specializations include a thickset tubular body with a

short muscular neck, powerful limbs, and a nearly hairless tail with a sensitive tip useful to its owner when scurrying in reverse. They also possess sensitive whiskers for guidance in dark tunnels, fur which lies smooth in either direction, small ears with valves to seal them off, eyes with special fluid to help keep them clean tightly closing eyelids, lips that close behind their incisors to out of their mouth while chewing through roots, and enlarged



A pocket gopher is an expert earth-mover. With hind feet spread wide to brace itself, it attacks the earth with powerful downward strokes of its hands. Long, sharp claws cut into the soil, brush-like bristles fringing the inner edge of its second and third digits, sweep it down below its belly, and hind feet kick it further along. When a pile accumulates, the pocket gopher pokes its nose under and back between its hind legs, somersaulting and twisting to reverse itself in the narrow tunnel. Then, like an animated bulldozer, with forepaws alongside its face, chest down, and hind feet pushing, the gopher moves the soil forward inch-by-inch with short, jerky shoves. At an opening, the dirt shoots violently outward forming a fan-shaped mound of soil. The last load of dirt is used to tightly plug the doorway. Only large enough to move through, the tunnels are about one-half to three inches in diameter, depending on the size of the digger.

Each entrance slants down and opens into an intricate maze of tunnels which form the pocket gopher's burrow. Tunnels near the surface (as little as six inches to as much as three feet below ground), used to gather and store food, can extend through over 2,000 square feet of soil. From this extensive complex of runways and storage areas, drops a shaft to a group of deeper excavations (usually three to six feet down, but up to 12 feet down). The lower chambers shelter nests, are used for sleeping, and become waste storage areas. An entire tunnel system is built and inhabited by only one pocket gopher.

In winter when snow covers the ground, pocket gophers tunnel through the snow as if it were soil. Over the winter, they fill up the snow tunnels with dirt from additional underground excavating efforts. When the snow melts, long sinuous "tubes" of soil settle onto the surface of the ground creating what are called "eskers."

Pocket gophers feast upon a cornucopia of underground plant parts such as tubers, bulbs underground stems and roots. They supplement their diet with some aboveground plants which they either pull down from below or harvest during occasional nighttime feeding forays on the surface. A massive skull, strong jaw muscles and four large continually growing cheek teeth in each quarter of the jaw are especially effective for grinding tough and abrasive plant materials. Food to be eaten later is quickly stuffed into their cheek pouches and carried to pantries within their burrow system.

Pocket gophers are extremely territorial and defend their home burrows tenaciously. Intrusion of one gopher into the territory of another will frequently trigger a bloody brawl. The only exception is during the breeding season, between March and mid-June, when males are allowed to enter the burrows of females. After a gestation period of about 18 or 19 days, four to seven young are born in a grass- or fur-lined nest. With few exceptions, most pocket gopher species have only a single litter of young each year. The newborns weigh about one-fifth of an ounce and wear loose, dark pink, furless skin. Their eyes and ears don't open for nearly a month. By 40 days they are weaned and just two weeks after that, they are forced to disperse from the nest.

Once establishing a burrow system of its own, a pocket gopher seldom leaves. One would think its underground existence would assure it a long life. To the contrary, a three or four year-old gopher would be a senior citizen and most gophers do not live past their second year. They are dug out by badgers, coyotes and foxes, sought out within their burrows by snakes and weasles, and caught above ground by owls and hawks.

The scourge of Bill Murray's movie, *Caddy Shack*, pocket gophers are often labeled as pests and fall demise to extermination efforts of people. Gophers do cause losses of crops, cut the roots of young trees, undermine irrigation systems and ruin the aesthetics of well-kept lawns. Their value ecologically however far outweighs their conflict with humans. Pocket gophers play an especially important role in soil dynamics. Their excavations continually mix and aerate different layers of the soil and enhance its moisture-holding capacity. Pocket gophers also enrich soil fertility by bringing organic matter down into the chambers of their burrows. One could certainly say that pocket gophers are good stewards of the environment.

Objective: Students will learn about some of the unique and interesting features (physical adaptations) of beavers and how those adaptations help beavers survive.

Method: A student volunteer is built into a simulated beaver with the beaver's adaptations made from objects that are similar.

Background: A beaver possesses an array of unique features that help it survive in its watery world. Its flat 12- to 17-inch long, paddle-like tail serves superbly as a rudder while swimming, and fully webbed hind feet help it swim fast. The beaver also slaps its tail on the surface of the water to warn of danger nearby. A clear, see-through inner eyelid covers and protects the beaver's eyes, and watertight flaps of skin seal off its nostrils and ears. Its lips can also be drawn tightly behind its teeth to let the beaver chew wood with its chisel-sharp teeth while under water, and a special flap at the back of its mouth seals off the mouth cavity from the air pipe. Large lungs hold extra oxygen for long dives. Also, waterproofing oil from a special gland, built in combs (split toenails on the fourth toe of each hind foot) to brush the oil over its coat, and dense water-repelling underfur keep the beaver warm and dry.

Materials: Pictures of a beaver, some string and tape, chisel, pair of swimming fins, swim goggles, swimming earplugs or ear muffs, nose plug, snorkel, two inflated large red balloons, thermal underwear top, raincoat, can of silicone waterproofing spray, small wooden canoe paddle, two combs.

Procedure:

1. Share pictures of beavers with the students. Ask them if they were a beaver, what kind of features they might need to help them live in water as real beavers do.
2. Discuss the meaning of the word "adaptation" -- in this case, a physical feature the beaver has to help it survive.
2. Ask one student to be a volunteer to become a beaver.
3. Use each of the items to then "build" a beaver by placing them on the volunteer. For each item, discuss how they represent the different adaptations that beavers have to help them survive.

Fins - fully webbed hind feet of a beaver that help it swim fast.

Thermal Underware - the warm under fur of a beaver that helps it stay warm.

Rain Coat - the outer coat of the beaver that keeps it dry.

Silicone Spray - the oil that the beaver spreads upon its fur to help its coat stay waterproof.

Combs - the split toenails on the hind foot of a beaver used to spread the oil on its coat while grooming (attach with string or tape to the fins).

Chisel - chisel-sharp teeth a beaver uses to chew wood for building its dam, its lodge and for food (tie to a string to hang around the student's neck).

Paddle - rudder like tail of the beaver used for steering while swimming and for slapping on the surface of the water to create a warning sound when danger is near (have student hold this or attach with a string around waist).

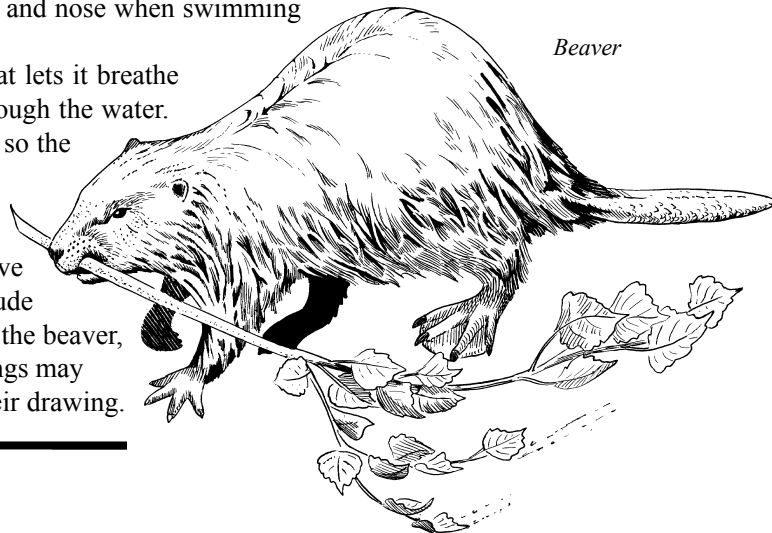
Goggles - special clear eyelids that cover and protect the beaver's eyes, letting it see underwater.

Ear and Nose Plugs - valves that seal off the beaver's ears and nose when swimming underwater to keep the water out.

Snorkel - represents the structure in the beaver's mouth that lets it breathe without getting water in its mouth when carrying wood through the water.

Red Balloons - large lungs of the beaver that hold extra air so the beaver can hold its breath for a long time (tape these on).

Discussion/Evaluation: Review the unique adaptations beavers have to help them survive in their environment. Have students draw their own beaver. Have them be sure to include details in their drawing showing the physical adaptations of the beaver, the way they are in reality (internal adaptations like large lungs may have to be skipped). Have them label the adaptations on their drawing.



History

Beavers Grow Fabulous Fur . . . And the Rest is History

No other animal has influenced the growth and expansion of our nation as has the beaver. The earliest fur traders in North America were French explorers and fishermen who arrived in what is now Eastern Canada during the early 1500s. Trade started after the French offered the Indians kettles, knives and other gifts in efforts to develop friendly relations. The Indians offered beaver pelts in return.

European beavers no longer existed in England since the late 13th century, and by the 16th century, they were close to extinction in most of Europe and Asia. In North America though, beavers were still abundant, and the “New World” it was thought, could offer a seemingly endless supply to meet the insatiable demand of the European market for pelts.

In 1608, a French explorer Samuel de Champlain established a trading post on the site of the present-day city of Quebec. The city became a fur-trading center. The French expanded their trading activities along the St. Lawrence River and around the Great Lakes. Eventually they controlled most of the early fur trade in what later became Canada. Demand in Europe continued to grow, and then in 1638, Charles I of England made a damning decree: “Nothing but beaver stuff or beaver wool shall be used in the making of hats.”

The Hudson Bay Company of Virginia was chartered in 1670. It was founded by a group of English merchants, with the help of two French fur traders, Sieur des Groseilliers and Pierre Esprit Radisson. The English government gave the company sole trading rights in what is now the Hudson Bay region. By 1733, they alone were responsible for exporting 200,000 of the 500,000 pelts a year exported from North America to Europe.

The demand for pelts in Europe, where gentlemen’s top hats made of felt from pressed beaver fur were in vogue, peaked in the early 1800s. Fur was also used by clothing manufacturers for coats, collars and cuffs. Through bartering, a person could trade one beaver skin for four pounds of shot, a kettle or a pound of tobacco, and 12 skins were good for a rifle. The demand for beavers though went further than just their pelts. Castoreum from their castor glands was used by Indians and Europeans for treating ailments such as colic, epilepsy, frostbite and hysteria. It was also highly desired by the perfume industry as a prime ingredient in fixatives.

By the 1700s competition in the fur trade market had greatly intensified. In 1754 the governor of French Canada tried to gain control over the Hudson Bay Company, triggering the French and Indian Wars. These wars were largely a business power struggle over the lucrative fur trading territories. English speaking people and their Indian allies prevailed, ending the French and Indian Wars in 1763.

In 1803, Thomas Jefferson expanded the U.S. Territory westward with the famous “Louisiana Purchase.” Soon after, the Lewis and Clark Expedition of 1804-1805 spurred on white man’s quest for beaver pelts and eventual development of fur markets all the way to the Pacific. Sewell Newhouse invented the steel trap in 1823 giving trappers a potent weapon far superior to earlier methods of taking furbearers. Trapping became big business. Though a harsh and dangerous existence, trappers could make more than \$15 per day, compared with a half-dollar a day working on a farm. Many a “mountain man” including Kit Carson, John Colter and Jedediah Smith gained notoriety through their trapping adventures. In Utah, Peter Skene Ogden, for whom Ogden is named, trapped many beavers in Utah and northern Nevada. Over the years, three million American beaver pelts had been marketed in Europe. Some of America’s wealthiest men including John Jacob Astor made their fortune from beaver pelts.

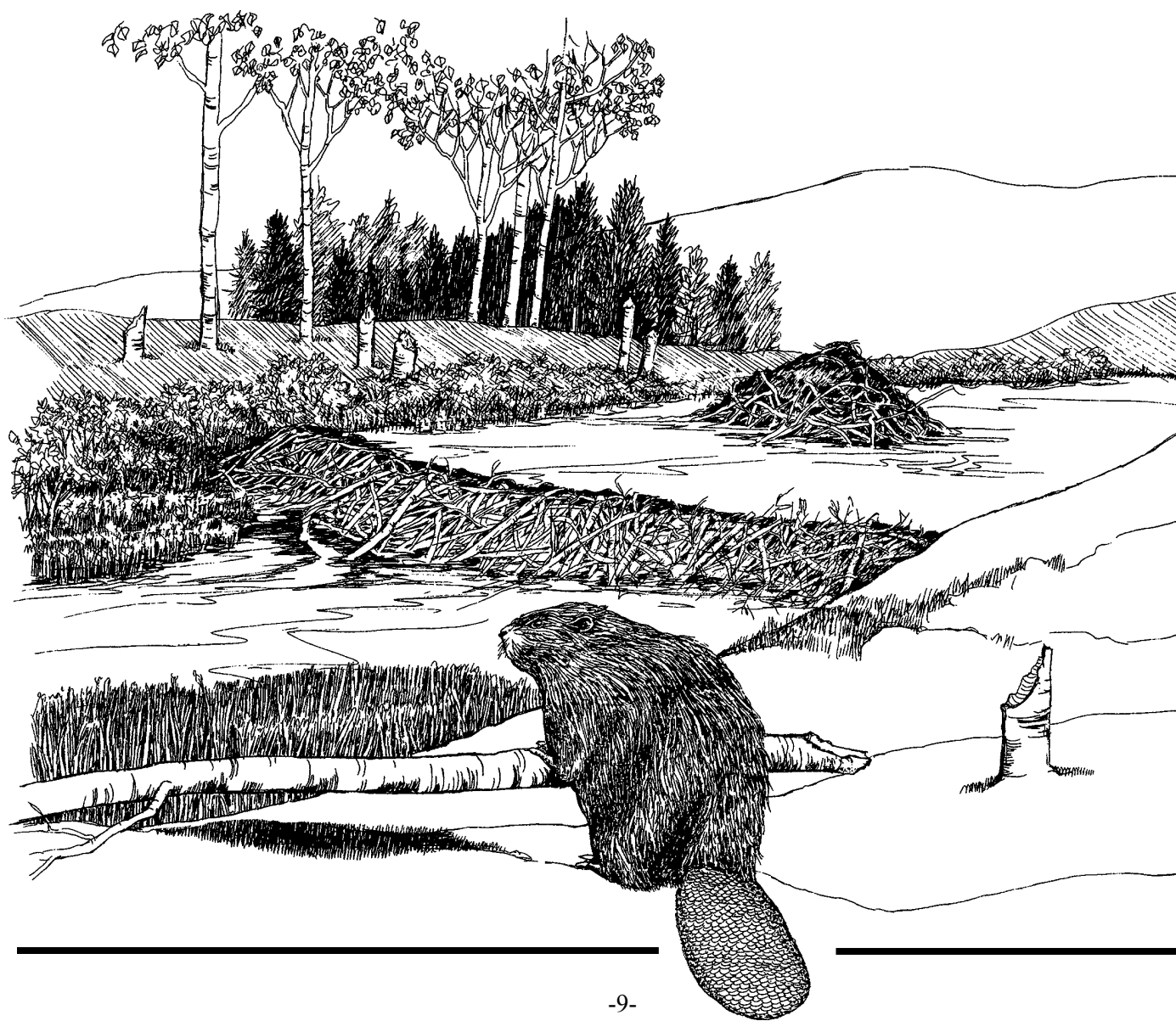
Prior to colonization, an estimated 60 million beavers worked the waterways of North America. By the 1800s, the continent’s beavers were all but gone, nearly vanishing from the West. This unconscious depletion of the beaver resource, and a swing in fashion from felt to silk in the mid-1800s, as a new process for making silk hats was developed, finally led to the collapse of the beaver market. But by the 1900s, only a mere 100,000 remained, leaving barely enough populations in this county for eventual recovery efforts. And with the beaver gone, the land itself began to suffer.

Beaver restoration efforts across the nation have been quite successful—in some places, too successful. Cutting trees, tunneling into dams and levies, and flooding crops, timber and roads tends to breed disdain among some. In Utah, permits to trap nuisance beavers can be obtained from the Division of Wildlife Resources. Licenses to trap beavers and other furbearers for sport can be purchased there as well. In the past several years, somewhere between 900 to 2,500

beavers per year have been trapped by an estimated 300 to 400 trappers. Pelts vary in value depending on the market for fur, but now bring somewhere between 10 and 25 dollars per pelt.

When beavers cause problems, they get attention. Their important contributions, however, often go unnoticed. In the right place, beavers are the ideal conservationists. In some areas of the west, habitat biologists have started to recognize this fact, and have begun employing beavers in habitat recovery efforts. Over time, in thousands of western valleys, once wet meadows where wagon trains pastured their stock, had become dry parched range as beaver populations were decimated. Lowered water tables led to fewer plants to hold soil moisture, overgrazed banks eroded into steep, barren edges, and streams, slowing to mere trickles, deepened into gullies. It was noticed how dams built by beavers, in turn captured silt, forming soft muddy banks and streams that run high enough to moisten arid lands, recreating wet, productive wildlife-rich valleys.

In certain American Indian creation stories, it was said that great beavers fetched the mud with which the Earth was built. They called the beaver “sacred center” of the land because they create rich habitats for many other animals, cradles of life rich with biodiversity. Such stories have been backed by modern science. Time after time, geologists and archaeologists have found that the first layer of organic material lying above glacial deposits is an ancient beaver pond with twigs and branches that show the marks of the beaver’s teeth. Today, somewhere between 6 and 12 million of these intriguing, dam building animals with flat tails and lustrous fur continue to shape the watery landscapes of our remaining wildlands.



Resources

Don't Get Stuck Without These!

Call Project WILD at (801) 538-4719

Free Resources:

Whither the Winter of Turtle and Beaver - Copy of an activity from "Keepers of the Animals: Native American Stories and Wildlife Activities for Children" by Michael J. Caduto and Joseph Bruchac which, through a puppet show, helps students learn about strategies beavers and other animals use to survive during the winter.

Get Busy Beaver! - Copy of article for kids about a day in the life of a beaver family. An issue of North Carolina WILD Notebooks produced by the North Carolina Wildlife Resources Commission. Includes a fun and easy beaver model-making activity.

Hoofbeats Through Our History: America's Wild Horses - Excellent article with information and activities, plus a wonderful poster featuring the wild horses that roam our public lands. Produced by the Bureau of Land Management.

Species on the Edge: Quality Management Is Quality Growth - Special Utah Division of Wildlife Resources publication highlighting Utah's threatened and endangered species recovery efforts.

Utah Wildlife 2002 Calendar - Wonderful photos of Utah's wildlife fill this new calendar for the year 2002.

Bats of Utah - Exquisite large poster featuring Utah's bounty of bats. Produced by the Utah Bat Working Group.

Snow Goose - Highlights the annual Snow Goose Festival held in Delta, Utah each winter.

Hardware Ranch - Features the Division of Wildlife Resource's annual Elk Festival held at Hardware Ranch.

Prairie Jewels: Waterfowl Production Areas - Beautiful 2001 National Wildlife Refuge Week poster.

Know Your Waterfowl - Colorful and informative Ducks Unlimited poster.

New Materials Available For Check-out:

Beaver Box - New trunk featuring the beaver. Includes: hide, skull, educational resource books, puppets, track replica, videos and more (available soon).

The Great Salt Lake: America's Legacy of Wetlands - A KUED special featuring the Great Salt Lake.

Silent Spring - A film profiling Rachel Carson and her historically significant book "Silent Spring" famous for exposing the effects of pesticides on the environment.

Fascinating Fishes - An episode from Marty Stouffer's "Wild America" television series. Great compliment to the Aquatic WILD activity "Fashion A Fish."

Internet Sites:

Watch two short video clips of beaver kits in action from the Toronto Zoo at <http://www.csh.rit.edu/~snell/beaver.html>

Listen to beaver sounds at <http://www.kwic.com/~pagodavista/schoolhouse/species/mammals/beaver.htm>

Print off beaver and porcupine educational coloring pages from <http://www.enchantedlearning.com/subjects/mammals/rodent>



Porcupine

Advanced Wildlife Workshop

The Green River: Changes Through Time

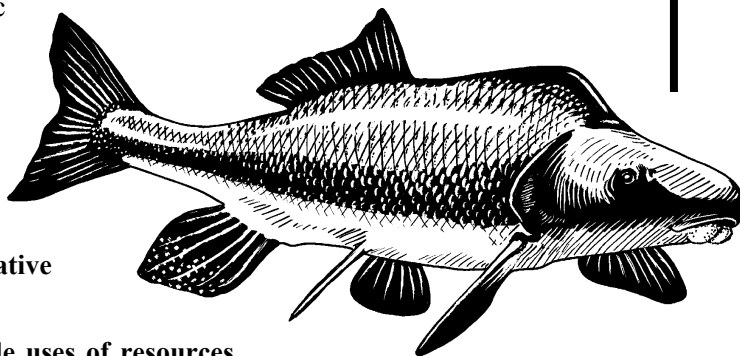
Join Project WILD and Utah Division of Wildlife Resources personnel in a fun and educational experience exploring the Green River Ecosystem by land and by water traveling on or along the Green River from Flaming Gorge to Ouray. The primary focus of this workshop will be the four endangered fish of the Upper Colorado River Basin and their historical, ecological and economic relationship to the Green River Ecosystem.

June 18-21, 2002

**Registration Deadline
March 21, 2002**

During this workshop, participants will:

- gain insight into the region's unique geological and paleontological history, and colorful human story through time;
- study natural history and ecology of the region's native fish as well as other wildlife and plants;
- examine some of the issues associated with multiple uses of resources and learn about current management practices to recover endangered fish;
- experience two exciting river excursions along the Green River and other fun recreational activities;
- receive a variety of wildlife education materials for teaching about the region.



Razorback Sucker

The workshop will begin in Vernal, Utah. From there, we will van-pool to various sites within the region including Dinosaur National Monument, Flaming Gorge Reservoir and the Ouray National Wildlife Refuge. We will be camping in a semi-rustic setting one night. Options on the two other nights include camping at the local KOA where meals and evening activities will center, returning home (for those who live nearby) or staying at a local hotel. The workshop will include two easy float trips on different sections of the Green River. Project WILD will provide all meals during the workshop.

Workshop Fee - See Below (Note: A substantial portion of the workshop costs are being covered by a grant from the US Fish and Wildlife Service's Endangered Fish Recovery Program).

Limit 20 people. Cancellations received after May 15, 2002 may be subject to forfeiture of the workshop fee.

USU graduate credit or state inservice/recertification credit will be available.

Tentative Times: Start - Early morning of June 18; End - Before lunch, morning of June 21.

Mail registration and fee by **March 21, 2001** to Project WILD, Utah Division of Wildlife Resources, P.O. Box 146301, Salt Lake City, UT 84114-6301. Questions: Call Diana Vos at (801) 538-4719 or e-mail dvos@state.us.us

Return form with check payable to UDWR

Name _____ Phone (h) _____ (w) _____

Address _____ City _____ State _____ Zip _____

Fee Options (Overnight choices for two of the evenings - one night camping required): **Choose one option.**

KOA Campsite: _____ Cabin shared with 2 other people (sleeping bag needed) - \$55. _____ Personal Tent - \$40.

_____ Stay at home: \$35. _____ Local Hotel: \$35. (hotel costs covered at own expense -list available upon request).

Project WILD Workshop taken when? _____ and where? _____

Project WILD



Utah Division of Wildlife Resources
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NATURAL RESOURCES
Division of Wildlife Resources

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UTAH



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Naturescaping Grants

Win a \$300 student action
grant from Project WILD for
the 2001-2002 school year!

What is a Naturescaping Grant?

It is money for students to conduct an action project to establish wildlife habitat on or near their school grounds. Providing habitat for wildlife is of increasing importance. Naturescaping projects allow students to take positive actions which will result in long-term benefits for wildlife.

Request an application and more details from Project WILD at **(801) 538-4719**. Complete and return application no later than **January 25, 2002**.